

CLAIMS

What is claimed is:

- 1 1. A method for inspecting portion of a substrate to be inspected, the
2 method comprising:
3 directing N multi-pixel incident beams respectively onto N multi-pixel areas on
4 the substrate;
5 detecting electrons emitted from the N areas in a parallel manner; and
6 translation of the substrate in a path that covers approximately 1/N of the
7 portion of the substrate to be inspected.
- 8 2. The method of claim 1, wherein the portion of the substrate to be
9 inspected comprises all integrated circuit dies on a wafer.
- 10 3. The method of claim 1, wherein the portion of the substrate to be
11 inspected comprises a fraction of dies on a wafer.
- 12 4. An inspection system for inspecting a specimen, the system
13 comprising:
14 a plurality of columns for directing a plurality of multi-pixel incident beams
15 onto a plurality of multiple-pixel regions of the specimen, wherein impingement of
16 said incident beams causes emission of electrons from the regions; and
17 a plurality of multiple-pixel electron detectors, each said detector configured
18 to detect in parallel electrons emitted from a plurality of pixels in one of the regions;
19 and
20 a plurality of processing sub-systems, each said sub-system configured to
21 process data from one of said detectors.
- 22 5. The system of claim 4, further comprising a translation mechanism for
23 translating the wafer under said plurality of incident beams such that the plurality of
24 regions are scanned across the wafer.

25 6. The system of claim 4, wherein at least one incident beam comprises
26 incident electrons.

27 7. The system of claim 4, wherein at least one incident beam comprises
28 incident photons.

29 8. The system of claim 4, wherein at least one incident beam comprises
30 incident electrons and at least one incident beam comprises incident photons.

31 9. A method for inspecting substrates with increased throughput to detect
32 defects in at least one patterned layer thereon, the method comprising:

33 directing a plurality of multi-pixel incident beams onto a plurality of multiple-
34 pixel areas on a substrate, wherein each said beam impinges on a different said
35 area;

36 detecting in parallel electrons emitted from the plurality of areas; and

37 processing in parallel data collected from the plurality of areas.

38 10. The method of claim 9, wherein the plurality of incident beams are
39 generated using a plurality of incident beam columns.

40 11. The method of claim 9, further comprising:

41 translation of the substrate in a path such that the plurality of incident beams
42 are scanned across the surface of the substrate.

43 12. The method of claim 11, wherein the plurality of incident beams
44 comprises N incident beams, and wherein an inspected area during the translation
45 comprises approximately N times an area covered by the translation path.

46 13. The method of claim 12, wherein N is at least two.

47 14. The method of claim 13, wherein N is no more than fifty.

48 15. The method of claim 9, wherein at least one incident beam comprises
49 incident electrons.

50 16. The method of claim 9, wherein at least one incident beam comprises
51 incident photons, and wherein the emitted electrons include photo-electrons.

52 17. The method of claim 9, wherein at least one incident beam comprises
53 incident electrons and at least one incident beam comprises incident photons.

54 18. The method of claim 9, wherein the processing in parallel comprises
55 comparison of the collected data from each area with another set of data.

56 19. The method of claim 18, wherein the comparison comprises alignment,
57 differencing, filtering, and defect location.

58 20. An electron-emission inspector apparatus having increased throughput
59 for inspecting semiconductor wafers, the apparatus comprising:

60 a first column for directing a first multi-pixel incident beam onto a first multiple-
61 pixel region of a wafer, wherein impingement of said first incident beam causes
62 emission of electrons from the first region;

63 a first multiple-pixel electron detector configured to detect in parallel electrons
64 emitted from a plurality of pixels in the first region;

65 a second column for directing a second multi-pixel incident beam onto a
66 second multiple-pixel region of the wafer, wherein impingement of said second
67 incident beam causes emission of electrons from the second region; and

68 a second multiple-pixel electron detector configured to detect in parallel
69 electrons emitted from a plurality of pixels in the second region.

70 21. The apparatus of claim 20, further comprising:

71 a first processor system for processing data from said first detector to inspect
72 for defects; and

73 a second processor system for processing data from said second detector to
74 inspect for defects.

75 22. The apparatus of claim 21, further comprising a translation system for
76 translating the wafer under said first and second incident beams such that the first
77 and second multi-pixel regions are scanned across the wafer.

78 23. The apparatus of claim 20, wherein the first and second incident
79 beams each comprises incident electrons, and wherein the first and second columns
80 each comprise an objective lens and a beam separator device.

81 24. The apparatus of claim 20, wherein the first and second incident
82 beams each comprises incident photons, and wherein the electrons emitted from the
83 regions comprise photo-electrons.

84 25. The apparatus of claim 20, wherein the first incident beam comprises
85 incident electrons and the second incident beam comprises incident photons.

86 26. The apparatus of claim 23, wherein the incident electrons are of
87 energies below 100 electron volts, and wherein the electrons emitted from the first
88 and second regions comprise reflected electrons.

89 27. The apparatus of claim 23, wherein the electrons emitted from the first
90 and second regions comprise secondary electrons.

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